UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
166 Water Street
Woods Hole, MA 02543

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# CRUISE RESULTS

NOAA Fisheries Research Vessel DELAWARE II
Cruise number DE 98-09 (Parts I and II)

Pelagic Trawl/Bioacoustic Shakedown

## CRUISE PERIOD AND AREA

The cruise period was divided into two parts; Part I for acoustic calibrations and pelagic trawl performance tests during August 24 - 28, and Part II for underwater video tests, exploratory transects, and *in-situ* target strength (TS) experiments during August 29 - September 3, 1998. Scientific staff were exchanged in Portland, ME on August 28 - 29. Operations were conducted in the Cape Cod Bay and Gulf of Maine regions (Fig. 1).

## OBJECTIVES

The cruise objectives were to (1) calibrate the Simrad EK500 echo-integration system, (2) conduct trawl performance tests of a pelagic trawl, (3) synchronize and test the Furuno CSH-5 omni-directional sonar, (4) test underwater video equipment, (5) conduct an exploratory survey to locate herring aggregations, and (6) develop standardized Northeast Fisheries Science Center (NEFSC) procedures for fisheries acoustic surveys.

## METHODS

Scientific operations during part I were allocated with calibration of the echo-integration system and tuning the pelagic trawl for optimal tow performance. Two different underwater video systems were tested during the beginning of part II. Upon completion of these goals, the remaining period of the shakedown cruise was devoted to conducting an exploratory survey by integrating the echo-integration, omni-directional sonar, pelagic trawling, and underwater video operations. Standardized procedures were developed for conducting future NEFSC fisheries acoustic surveys during the final phase. Sequential deployment numbers were used in data logging and recording throughout the cruise. Transects during the cruise were also sequentially numbered, and a transect was defined as the portion of cruise track between two points where the ship heading and speed remained constant. All computers and data collection were synchronized using the FRV DELAWARE's Scientific Computer System (SCS) clock.

Simrad EK500 System and Calibration:

The Simrad EK500 (v.5.30) Scientific Sounder System is state-of-the-art acoustic instrumentation designed for estimating absolute fish abundance. The EK500 is capable of accurate acoustic detection due to its low self-noise, high transmit power, unlimited dynamic range, and efficient transducers. The FRV DELAWARE's EK500 system has three downward looking hull-mounted transducers (one single-beam transducer operating at 12 kHz, and two split-beam transducers at 38 and 120 kHz). The EK500 collected acoustical data from the 12, 38, 120 kHz frequencies simultaneously, and logged data through a TCP/IP ETHERNET line to the SIMRAD BI500 Bergen post-processor. The BI500 was operated on a SUN Sparc-10 workstation where the acoustic data was processed and archived as binary files in the UNIX-based INGRES relational database. The BI500 post-processing software was used to filter unwanted noise and partition acoustic backscatter by species composition.

The EK500 is capable of estimating species-specific abundance of fish provided the system is accurately calibrated. For each frequency (12, 38, 120 kHz), calibration was completed by suspending a standard calibration sphere of known target strength below the hull-mounted transducer. The size and theoretical target strength (TS) of the Simrad copper calibration spheres were 45.0 mm diameter at -40.4 dB, 60.0 mm at -33.6 dB, and 23.0 mm at -40.4 dB for the 12, 38, and 120 kHz, respectively. For each frequency, the sphere was suspended within the acoustical beam using four monofilament lines from remotely controlled downriggers. The 38 and 120 kHz split-beam transducers were calibrated using the Simrad Lobe (v.95-01-17) program to calculate the corrected TS gain, 3 dB beam angles, and mechanical offset angles. Integration tables were used to adjust the $S_v$ gain settings. The single-beam 12 kHz transducer was more difficult to calibrate compared to a split-beam transducer, and its beam offset parameters could not be determined. This is because a single-beam transducer lacks the directionality for tracking a target within its beam, unlike a split-beam transducer. Another disadvantage of the 12 kHz transducer was that the sphere must be centered no closer than 35 m from the transducer during calibration. Given these difficulties, the 12 kHz transducer was not calibrated despite repeated attempts. Therefore, the 12 kHz transducer parameters from last year's calibration were applied to this year's survey. Ambient noise tests were also conducted to ensure there was no cross-interference between the FRV DELAWARE's acoustical instruments.

Pelagic Trawl FS903/ITI Monitoring System:

The Simrad FS903 Trawl Monitoring System is a third-wire sensor that provided real-time sonar images of the trawl net opening. The FRV DELAWARE's third-wire constant tension winch was used to maintain proper wire tension necessary for good trawl performance. The FS903 system's depth, temperature, catch, and sonar sensors were housed in a module (model FS3300) that was attached to the trawl headrope. The FS903 sonar operating at 330 kHz has a scan range up to 100 m. The sonar images were displayed on the bridge and winch room providing real-time monitoring of the trawl net opening, tow performance, depth profile in relation to the bottom and surface, and individual fish targets passing through and around the net opening. The FS903 sensors were powered by 220 v, therefore the power was turned-on only when the sensor was in the water for safety reasons.

The Simrad ITI Trawl Monitoring System included six wireless sensors that were attached to the trawl. These ITI sensors communicated acoustically to the FRV DELAWARE's hull-mounted ITI transducer array. The ITI system has a triple transducer head in which one transducer was mounted directedly aft, while the other two transducers were offset by $30^0$ to detect the trawl tow aspect in relation to the ship heading. A pair of ITI Spread #1 and #2 sensors were attached to each midwater trawl door and upper wing bridle, respectively. The ITI Depth-Temperature and Height sensors were attached to the trawl headrope.

High Speed Midwater Rope Trawl (HSMRT):

A recently purchased High Speed Midwater Rope Trawl (HSMRT, Gourock design # R202825A) was tested by the NEFSC for the first time. A similar trawl was borrowed from the Southwest Fisheries Science Center during a previous cruise (refer to Cruise Results DE 98-02), and its performance indicated that the HSMRT trawl design was suitable for capturing pelagic fish from the FRV DELAWARE. The rope trawl design was selected for the advantage of reduced meshes in the wing to minimize drag. The HSMRT could easily be towed at 4.5 - 5.0 knots from vessels similar in horsepower to the FRV DELAWARE II (about 1,100 - 1,200 hp). Towing at high speeds is necessary for reducing fish avoidance problems, particularly for fast swimming fish like mackerel.

The HSMRT is a four seam pelagic trawl with 53.1 m headrope, footrope, and breastlines (Fig 2). The HSMRT was rigged with a pair of 1.8 $m^2$ double-foiled Suberkrub-type USA Jet doors. Each door weighed 433 kg including two attached shoe-weights (43.5 kg per weight). The door dimensions are 83 x 227 cm. The upper and lower bridles and legs were 62.4 m in length (Fig. 3). Trawl performance tests were conducted at various ship speeds, scope, and adjustments in rigging. The Simrad ITI and FS903 trawl monitoring systems were used to obtain real-time trawl performance measurements. Minilog depth-temperature probes were attached to the trawl footrope and headrope providing continuous depth-temperature data during a deployment.

Furuno CSH-5 Omni-directional Sonar:

The FRV DELAWARE's Furuno CSH-5 Omni-Directional Sonar system is a full-circle multi-beam scanning sonar that was designed for detecting fish schools. The retractable transducer has a few hundred elements arranged cylindrically and the transmission pulse covers a full $360^0$ simultaneously. Its cone-shaped receiving beam can be tilted at various angles from the surface, and the center of its beam was typically angled $7^0$ from the surface during calm weather. During rough weather, the beam tilt angle was set at $10^0$ to eliminate surface noise. The vertical width of the receiving beam is $15^0$ resulting in a horizontal search radius of 800 m in waters with bottom depths of around 200m. The search radius on the display was set to 400 m during most of the operations. In shallow waters of less than 80 m depth, the search radius was lowered to 250 m. The omni-directional sonar operates at 55-64 kHz, and this frequency interfered with the EK500 operations. To eliminate this acoustical interference, the external trigger of the sonar was wired to the EK500 to synchronize its ping rate (Fig. 4). This improvement allowed the omni-directional sonar to be used simultaneously during EK500 survey operations to provide a horizontal search radius for locating fish aggregations. The CSH-5 sonar was not designed for scientific data output, therefore a video capture board was installed to collect sonar images. The analog sonar images were captured every 30 seconds and merged with SCS navigational data. These sonar data provided greater horizontal spatial resolution of fish schools which supplemented the downward-looking EK500 echograms.

Underwater Video Systems:

An Static Underwater Stereo Video System (SUSVS) was designed by the NEFSC to directly verify acoustic targets within the EK500 beam (Fig. 5). The SUSVS was deployed midship along-side the EK500 acoustic beam, while the FRV DELAWARE drifted over selected backscatter aggregations. Matched underwater video cameras (DSP&L MicroSea B&W 1050) were mounted in the array to obtain stereo imagery of targets. The cameras have a low light (0.05 lux) auto adjusting iris with a $77^0$ horizontal and $59^0$ vertical view field. A pair of DSP&L SeaLasers 100-15 were mounted in parallel (5.4 cm off center) for measuring target size. Two DSP&L SeaLites provided illumination which could be dimmed remotely using a 120 v voltage regulator. The real-time depth profile, temperature, compass bearing, and three-dimensional orientation of the camera system were recorded every 10 seconds from an attached JASCO Attitude Sensor. Real-time dual video and environmental data were recorded from the underwater array, through a 300 m multiconductor cable, to a PC computer and SVHS video recorders (Fig. 6 and 7). Stereo video was synchronized by individual frame using a Horita time-code generator.

A self-contained video system was developed by the Alaska Fisheries Science Center (AKFSC), and borrowed by the NEFSC for examining the HSMRT trawl performance. This system consisted of a water-tight housing with a camcorder that recorded to Hi-8 tape.

## RESULTS

Scientific operations began with 9 hours of EK500 calibration while drifting in Cape Cod Bay (Fig. 1). The remaining 2½ days of part I were devoted to the HSMRT trawl performance tests. Exploratory transects were conducted Fippennies Ledge during part I to test the EK500 and omni-directional sonar operations.

Part II began on August 29 after a portcall in Portland, Maine to exchange scientific staff. Scientific operations during part II included underwater video tests, exploratory survey transects in the Fippenies Ledge, Cashes Ledge, and Jeffreys Ledge regions (Fig. 1). An *in-situ* TS experiment was also conducted in The Cove on Jeffreys Ledge. A total of 36 pelagic trawl and underwater video deployments (Table 1) and 119 acoustic transects (Table 2) were completed during the cruise.

Simrad EK500 Calibration and Operations:

The EK500 split-beam 38 and 120 kHz transducers were successfully calibrated in Cape Cod Bay with a high degree of precision while the FRV DELAWARE drifted. The

TS gain, 3-dB beamwidth, mechanical offset angles, and $S_v$ gain values were similar to calibrations conducted during previous cruises (refer to Cruise Results DE 97-08 and DE 98-02), therefore the EK500 transceiver settings were not changed from last year.

The 12 kHz single-beam transducer could not be calibrated due to the lack of directionality with the single-beam transducer. Calibration of the 12 kHz was further complicated by the need to have the sphere more than 35 m below the transducer. Therefore, transceiver settings from last year's calibration were also used for the 12 kHz. It is recommended that the 18 kHz split-beam transducer be considered as a replacement for the existing 12 kHz single-beam transducer. There is minimal difference between the depth ranges of the 12 and 18 kHz, and 18 kHz split-beam provides more accurate quantitative data for fisheries assessment in contrast to the 12 kHz single-beam transducer.

EK500 data was collected from 1,733 nautical miles (119 transects) along the cruise track. Aggregations of Atlantic herring schools were identified and partitioned from the echograms based on their target strength (TS) distribution, school structure, diel behavior patterns, trawl catches, and video observations. Silver hake was the only species commonly captured during the cruise that had similar TS distributions to herring, however their schooling structure was typically not as tightly packed as herring. *In-situ* TS experiments in The Cove of Jeffreys Ledge confirmed last year's observation in that herring generally aggregation near bottom during the day, and move into the water column and near surface during night. Their individual TS appeared to be less during night, therefore the abundance estimates for herring could be higher for night sampling in comparison to the day estimates.

<u>HSMRT/ITI/FS903 Pelagic Trawl Performance</u>:

The first 13 deployments using the HSMRT trawl were conducted during part I to test and adjust its performance. The HSMRT performance was tested at various ship speeds (3.5 - 5.2 knots), wire-out, door spread and tomweight adjustments. The optimum setback was determined to be 2.5 m from HSMRT performance tests during a previous cruise (refer to Cruise Results DE 98-02). The ITI/FS903 trawl monitoring data were recorded during all trawl deployments, except the FS903 system was not used during the first three deployments. The trawl cod-end was open during all but one deployment (HSMRT/ITI/FS903 # 7) during part I.

The first HSMRT/ITI tow (deployment # 1) was invalid due to twisted bridles. The HSMRT/ITI # 2 deployment was tested using 227 kg (500 lb) tomweights per wing and the door/bridle connections set for intermediate spread. The tomweights were increased to 318 kg (700 lb) for HSMRT/ITI # 3. Given good performance from the last two hauls, the FS903 was deployed with the HSMRT/ITI during the remaining cruise. Door/bridle connections were adjusted for maximum spread for HSMRT/ITI/FS903 # 6 and #7, and 318 kg and 227 kg tomweights were used respectively. HSMRT/ITI/FS903 # 9 was tested at intermediate door spread with 227 kg tomweights, but the FS903 connection failed due to cable slippage around the tension relief coil. The tomweights were increased once again from 227 to 318 kg between HSMRT/ITI/FS903 # 10 and # 11. During the last two tows (# 12 and # 13) of part I, six 22.7 kg lift floats were attached to the headrope to test near-surface tow performance. Using the six headrope floats, the best surface tow configuration was achieved using 91 kg tomweights (HSMRT/ITI/FS903 # 13) rather than 227 kg tomweights (HSMRT/ITI # 12).

During part II, the first three HSMRT/ITI deployments (15, 17, and 18) were devoted to tests with an attached self-contained underwater video system. A forth test trawl with attached video (HSMRT/VIDEO # 24) was conducted later on Jeffreys Ledge. The HSMRT/ITI/FS903 gear was successful deployed for capturing herring and silver hake on Cashes Ledge (# 19 and # 21) and Jeffreys Ledge (# 22). Deployment of the HSMRT/ITI/FS903 # 26 deployment was delayed when the stern ramp door malfunctioned. During the repair, the trawl was streamed behind the vessel as it circled resulting in twisted bridles and meshes during deployment # 26.

Results from trawl tests indicated that small adjustments in the door/bridle rigging dramatically affected its tow performance. The optimum tow configuration for the HSMRT trawl was achieved using 2.5 m setback, 227 kg tomweights per wing, intermediate door spread using two door weights per door, and tow speeds of 4.5 ± 5 knots. It was difficult to set the doors below the surface at 4.5 knots when setback was lengthened to 5 m, while zero setback resulted in the trawl taking a dramatic dive towards the bottom. There was little difference between 227 and 318 kg tomweights, therefore the tomweights were reduced to 227 kg for easier deck handling. The doors were most stable at the intermediate door spread connection and with two door shoe-weights per door (43.5 lb each). The lowest tow speed for stabilizing the doors at a fixed depth was 4.0 knots, whereas the doors would not remain in the water column at 3.5 knots. The maximum acceptable tow speed for the HSMRT trawl using the FRV DELAWARE was 5.0 knots, and 4.5 knots is recommended for conducting herring surveys. Given the optimum tow configuration at 4.5 knots, HSMRT trawl net opening averaged about 13 ± 3 m vertically and 27 ± 5 m horizontally. The HSMRT towed at 4.5 knots had a scope (wire-out : footrope depth) ranging from 4 : 1 to 3.5 : 1 when fishing to 50 - 140 m depth. Figure 8 provides an example of the HSMRT's performance at various wire-out and tow speeds.

The Simrad ITI and FS903 trawl monitoring sensors provided measures of trawl performance, but some difficulties were encountered and resolved during the shakedown. There were some ITI communication delay problems which were improved slightly by better sensor placement on the trawl. Problems were also encountered with the first attempts using the FS903 system. The FS903 display suggested the sonar cylinder was not properly seated, therefore the module was opened and the cylinder reseated. The following tow resulted in the FS903 cable being pull out of the FS903 suitcase. This problem was resolved by ensuring proper attachment with an adequate harness and securing the cable tightly around the tension relief coil. The FS903 was considered the more reliable trawl monitoring sensor in comparison to the ITI because of its instantaneous monitoring of trawl performance and catch. An additional advantage of the FS903 third-wire system was it was used to keep the headrope above wing meshes during deployment to eliminate trawl mesh and bridle tangles. Overall, midwater trawl operations were significantly improved during the shakedown as the FRV DELAWARE's crew became more experienced with the assistance from the midwater trawl specialists from the Alaska Fisheries Science Center and Gourock Trawl Company.

Furuno CSH-5 Omni-directional Sonar:

The FRV DELAWARE's omni-directional sonar (operating at 55-64 kHz) was successfully synchronized with the EK500 to eliminate acoustical cross-interference. The external trigger of the sonar was used to control its ping rate as a slave to the EK500. This improvement allowed the omni-directional sonar to be used simultaneously during EK500 acoustic surveys to provide a horizontal search radius for locating fish aggregations. The center of the sonar beam (which has an omni-directional beam of $15^0$ vertical cross-section) was set at $7^0$ from the surface, and its search radius was set at either 400 or 800 m depending on the bottom depth. The video capture board was successfully installed on the sonar system, and analog sonar images were captured every 30 seconds. These data provided greater spatial resolution of fish schools that supplemented the downward-looking EK500 echograms.

Underwater Video Systems:

The Static Underwater Stereo Video System (SUSVS) operated successfully, but its 300 m of video cable was difficult to deploy by hand. It is recommended that a dedicated portable winch system be obtained for future underwater video operations. The stereo cameras were calibrated with a cube of plexiglass tubing having the dimensions of 30 cm x 30 cm x 30 cm. Although the lights of the SUSVS caused some degree of avoidance as indicated by the EK500 backscatter, the video operations were successful at verifying some of the acoustic targets (e.g., euphausiids, Pandalus spp. shrimp, and Atlantic herring). Future video operations should investigate new optic and lighting technologies to minimize avoidance problems.

The self-contained video system was successfully attached to the HSMRT trawl during four deployments (15, 17, 18, and 24), and was used to document trawl performance and observed silver hake behavior as they passed through the trawl net opening.

Scientific Computer System (SCS):

The FRV DELAWARE's Scientific Computer System (SCS) collected navigational, oceanographic, and meteorological data throughout the cruise track at a sampling rate of every 30 seconds. These data provided time and navigational input directly into the acoustic data, and provided the framework for all data collection. It is recommended that the ITI and FS903 data should be merged into the FRV DELAWARE's Scientific Computer System (SCS) system, rather hand-recording the measurements by hand. A hand-entered PC event log was maintained throughout the cruise using an EXCEL spreadsheet, but this should be replaced on future acoustic surveys by a modified SCS Event-logging program.

Some testing was conducted with the Acoustic Doppler Current Profiler (ADCP) to determine optimal settings for NEFSC fisheries acoustic surveys. It was concluded that the ADCP configured in the wide-band mode had acoustic interference with the EK500's 120 kHz frequency. However, acoustical interference between the EK500 and ADCP was eliminated by modifying the ADCP configuration script to the narrow-band mode. The Amtek speedlog caused acoustical interference problems with the ADCP and EK500, therefore could not be used during acoustic survey operations.

## DISPOSITION OF DATA

Data and results were archived at the Northeast Fisheries Science Center, and will be available through the NEFSC Oracle relational data management system.

## SCIENTIFIC PERSONNEL

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| William Michaels | Chief Scientist | Parts I & II |
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| Douglas Perry | Ocean Engineer | Part I |
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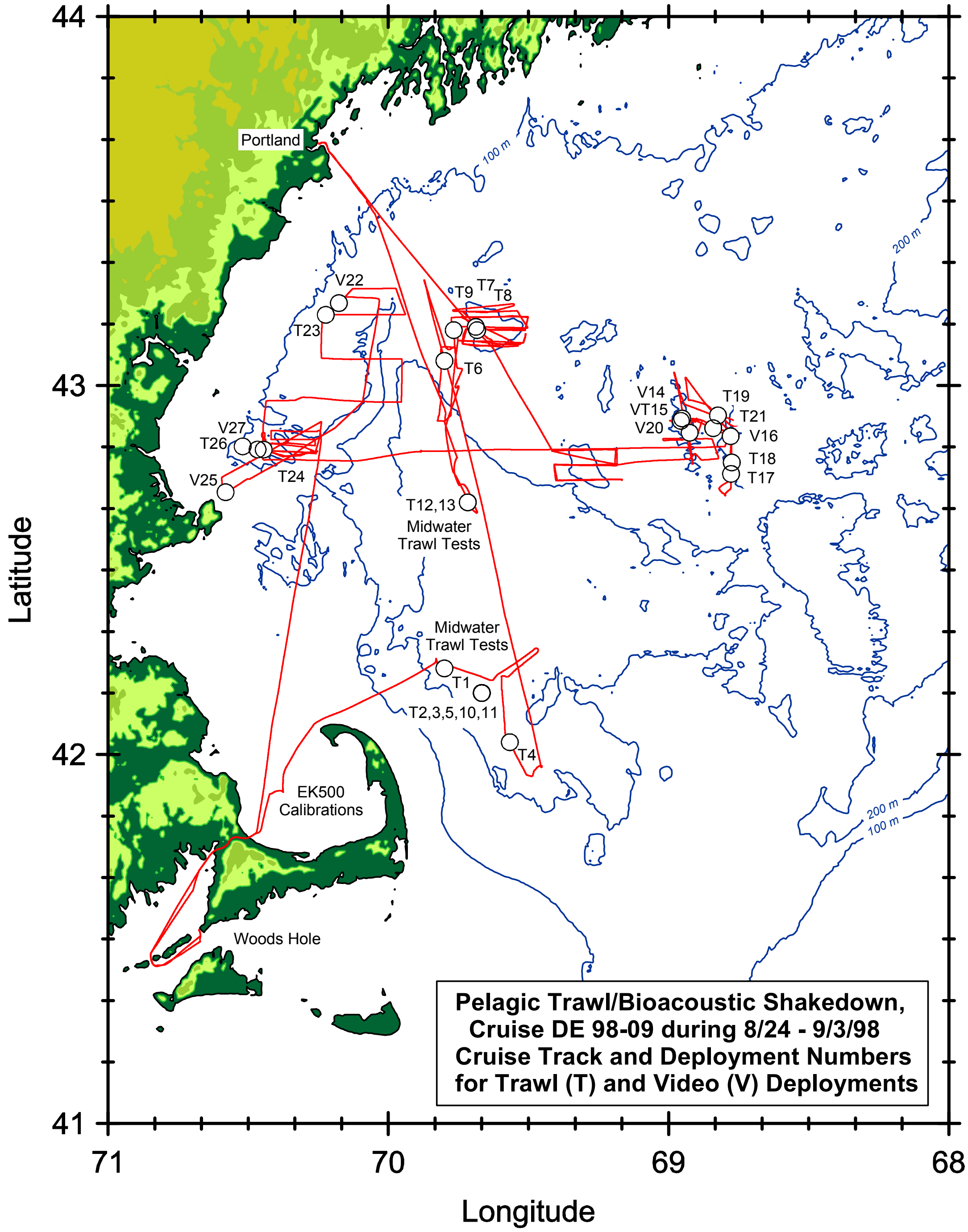


Figure 1. Cruise track and deployment numbers for the Pelagic Trawl/Bioacoustic Shakedown Cruise DE 98-09 during August 24 through September 3, 1998.

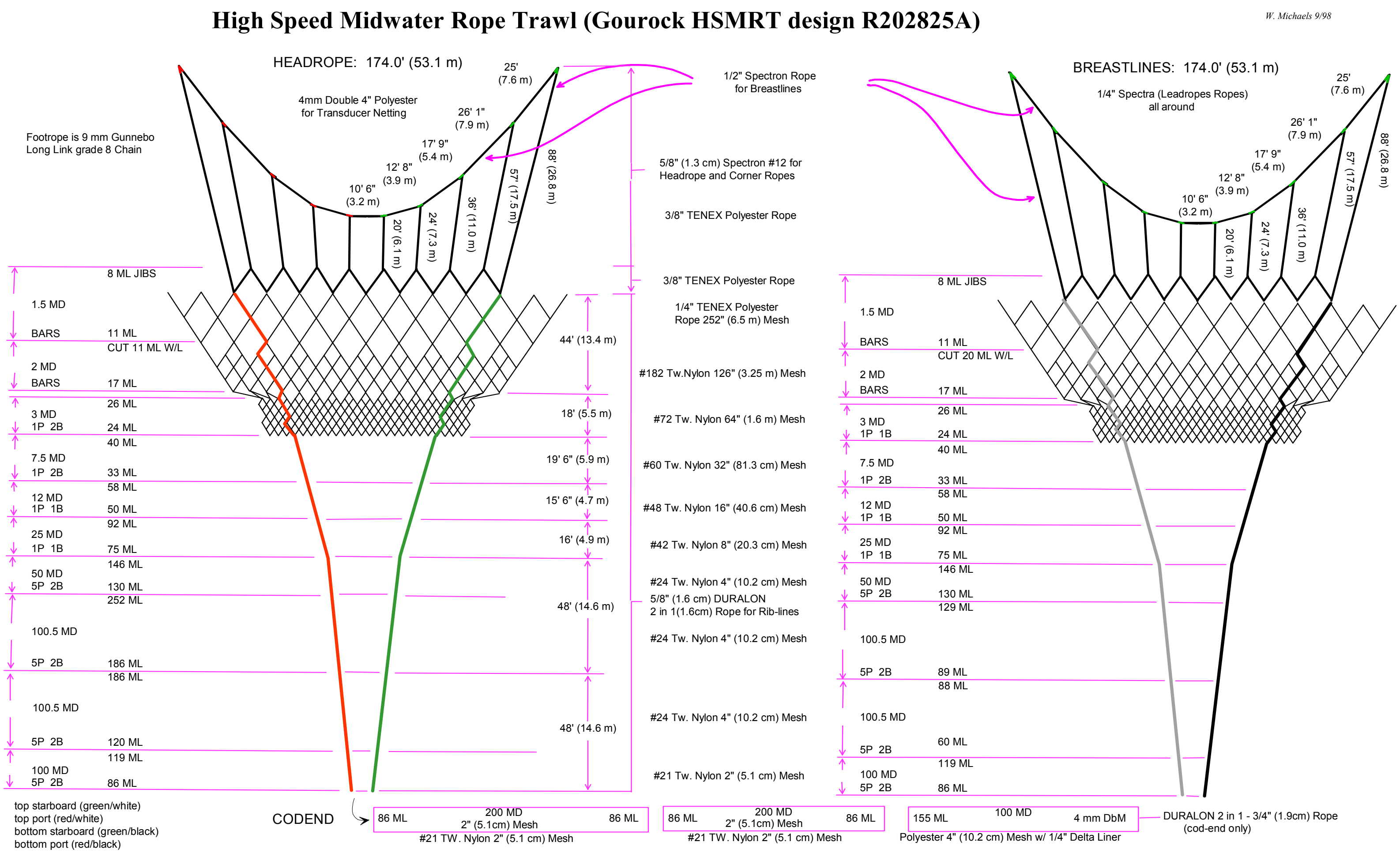


Figure 2. Systematics for the High Speed Midwater Rope Trawl (HSMRT, net design R202825A) used aboard the NOAA FRV DELAWARE II during the Pelagic Trawl/Bioacoustic Shakedown Cruise DE 98-09.

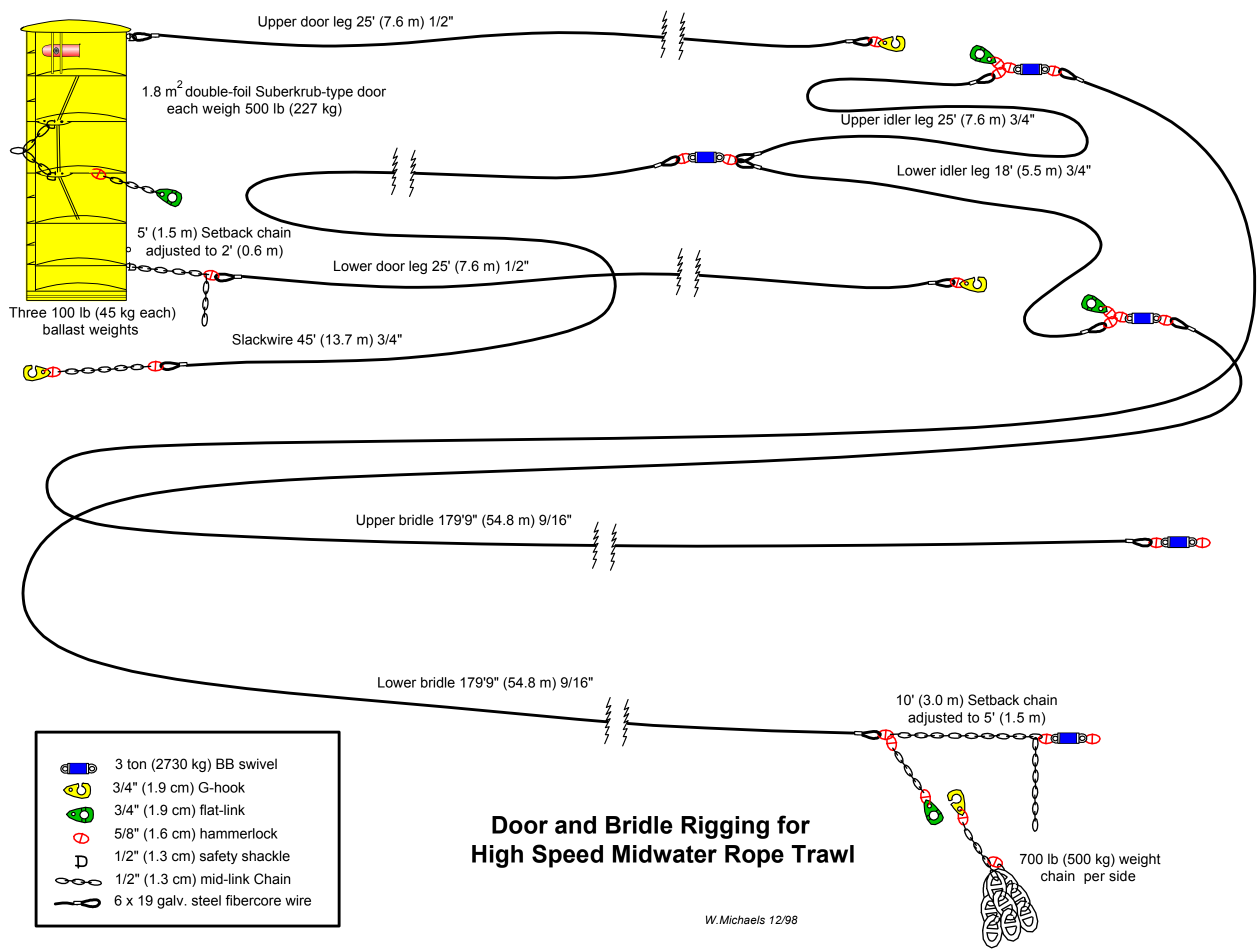


Figure 3. High Speed Midwater Rope Trawl (HSMRT) bridle and door rigging used aboard the FRV DELAWARE II during the Pelagic Trawl/Bioacoustic Shakedown Cruise DE 98-09.

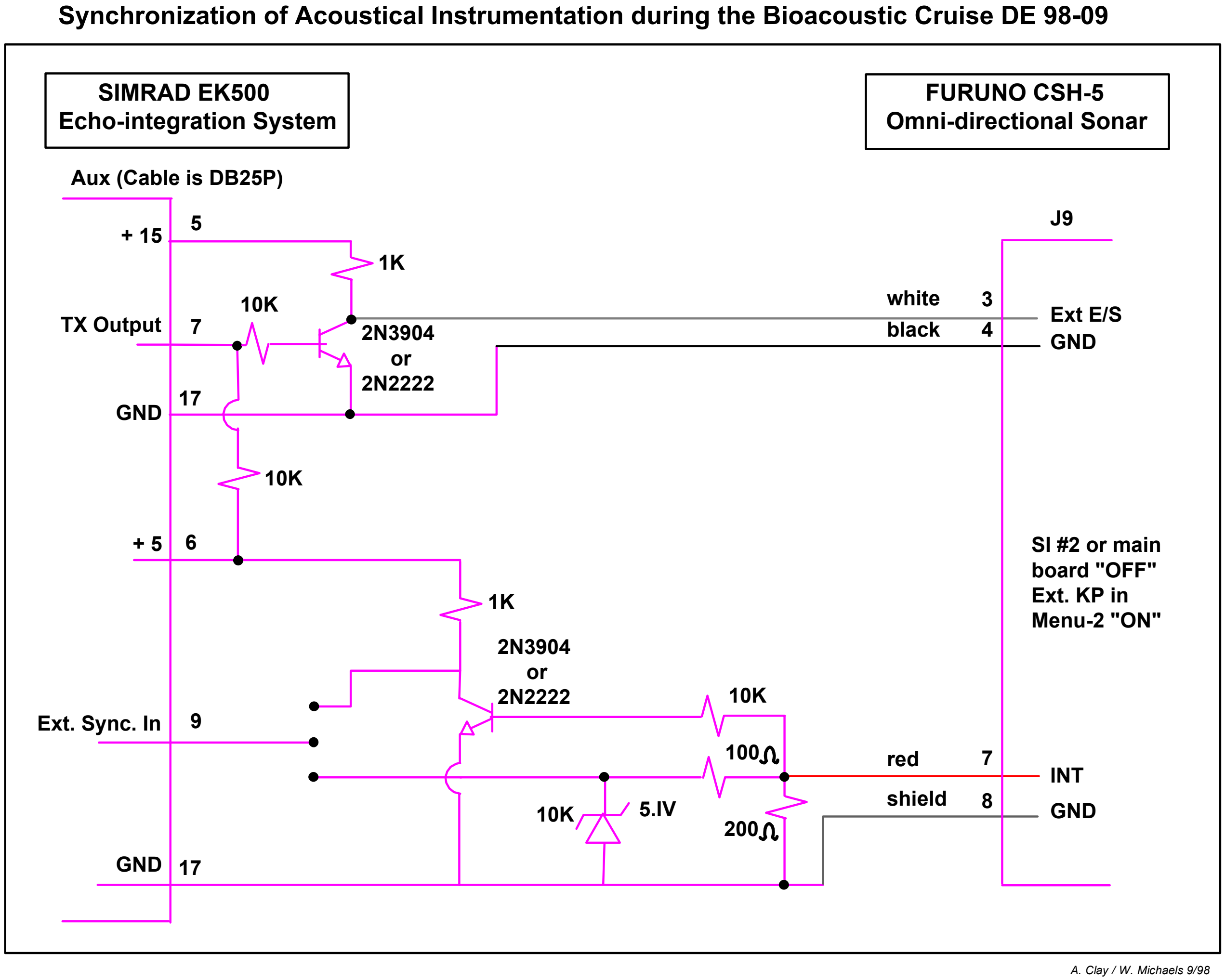


Figure 4. Systematic for synchronizing the ping rates between the Simrad EK500 echo-integration and Furuno CSH-5 Omni-directional Sonar systems aboard the FV/R DELAWARE II during the Pelagic Trawl/Bioacoustic Shakedown Cruise DE 98-09.

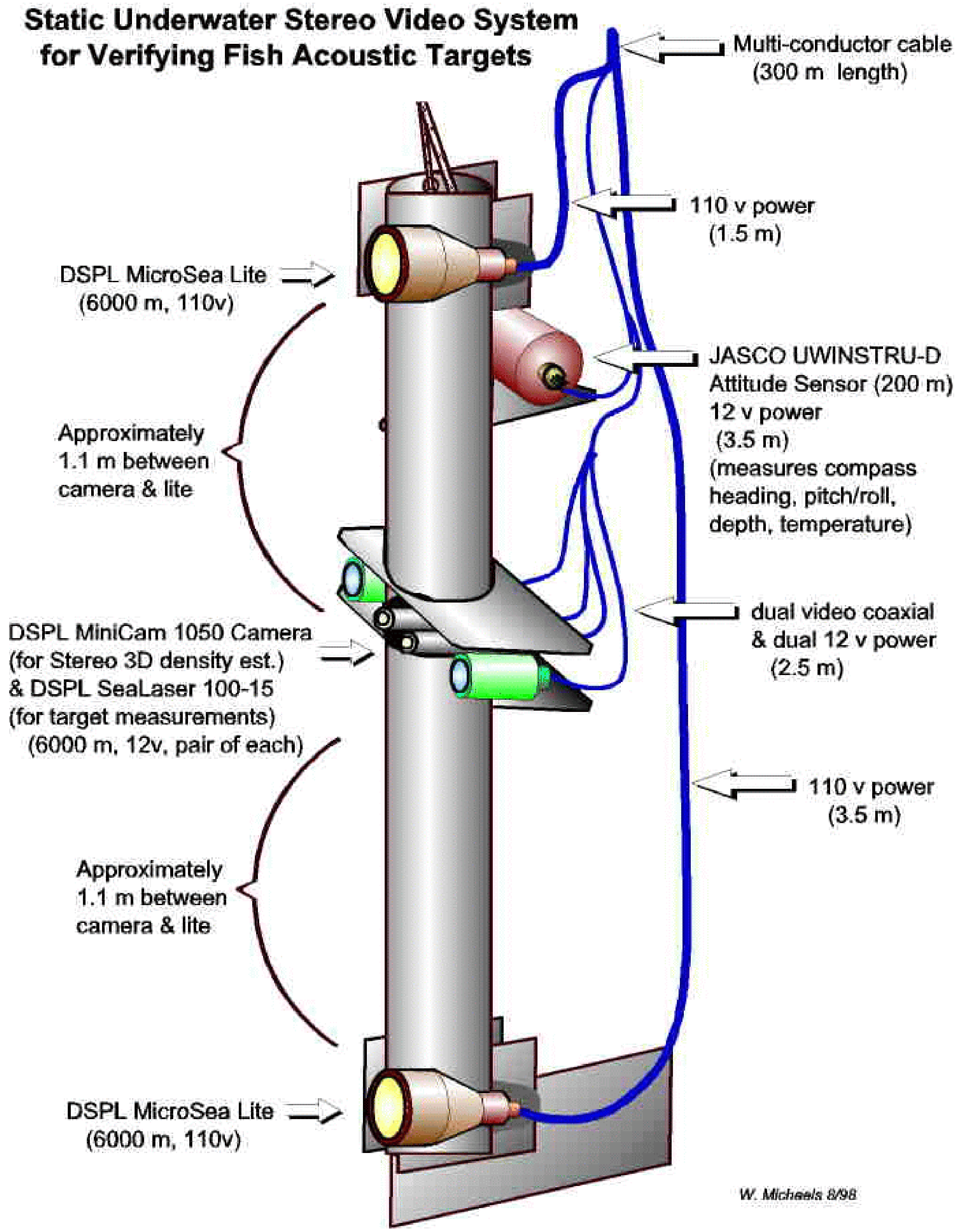


Figure 5. Static Underwater Stereo Video System (SUSVS) used aboard the NOAA FRV DELAWARE II during the Pelagic Trawl/Bioacoustic Shakedown Cruise DE 98-09.

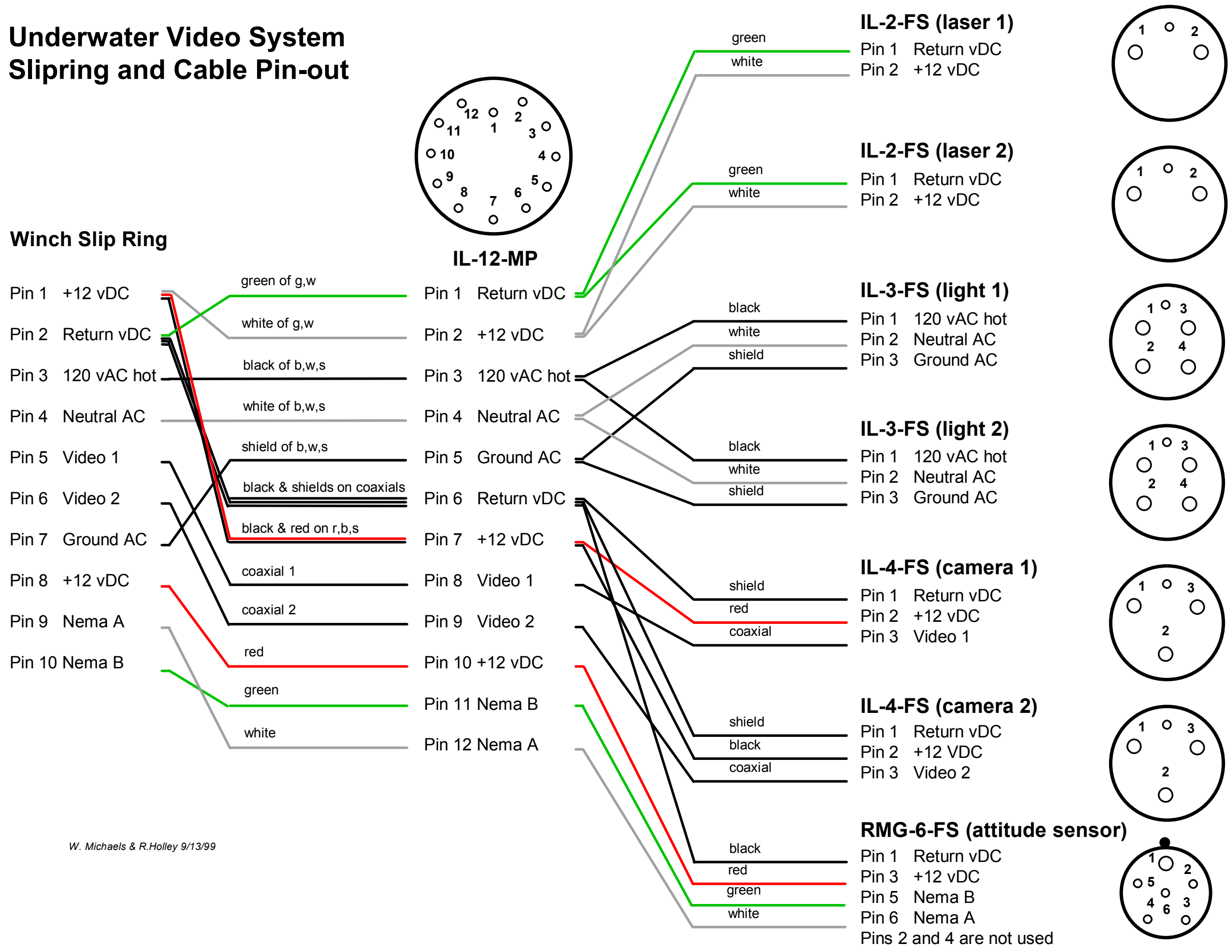


Figure 6. Cable pin-out for the Static Underwater Stereo Video System used aboard the NOAA FRV DELAWARE II during the Pelagic/Bioacoustic Shakedown Cruise DE 98-09.

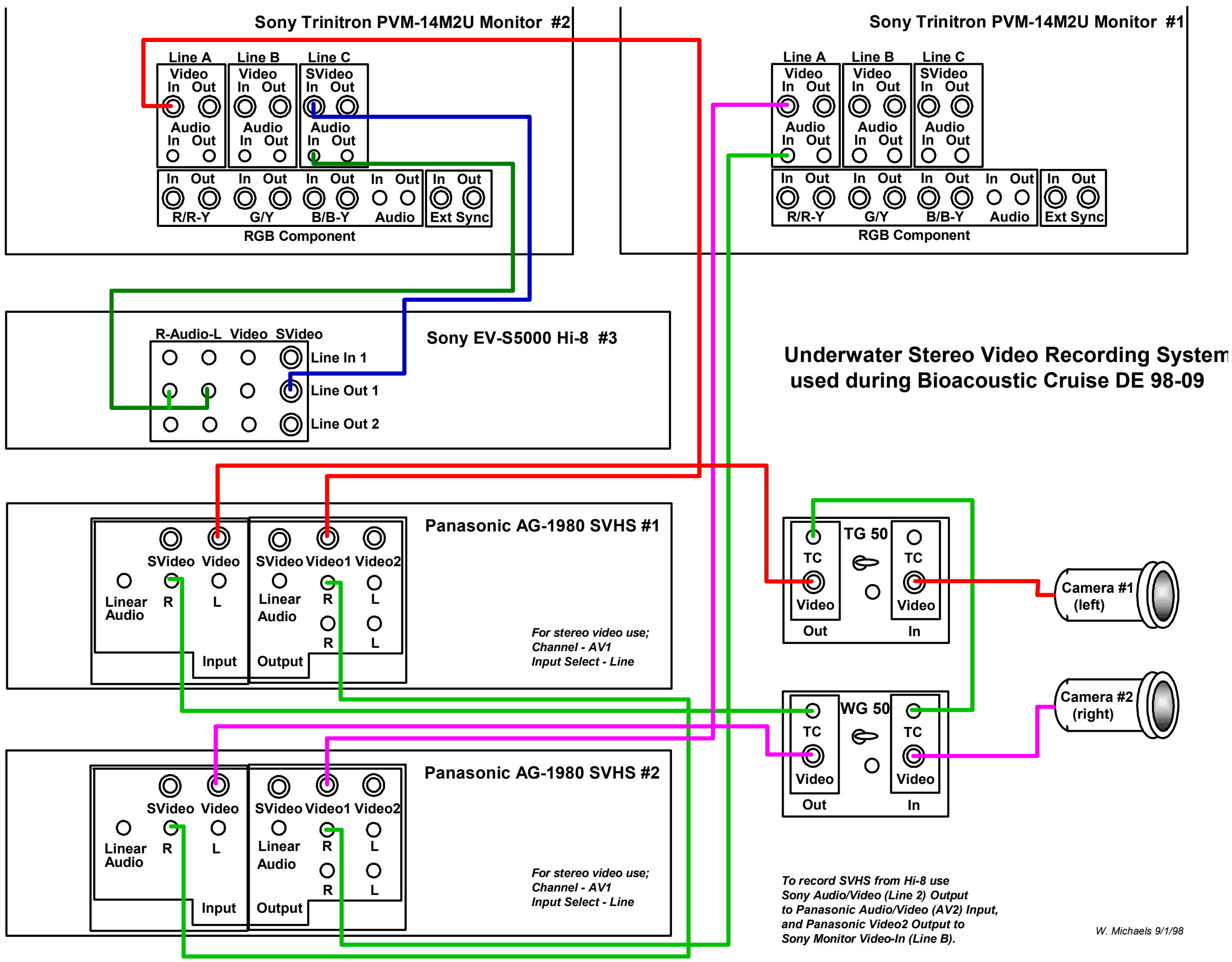


Figure 7. The recording system for the Static Underwater Stereo Video System used aboard the FRV DELAWARE II during the Pelagic Trawl/Bioacoustic Shakedown Cruise DE 98-09.

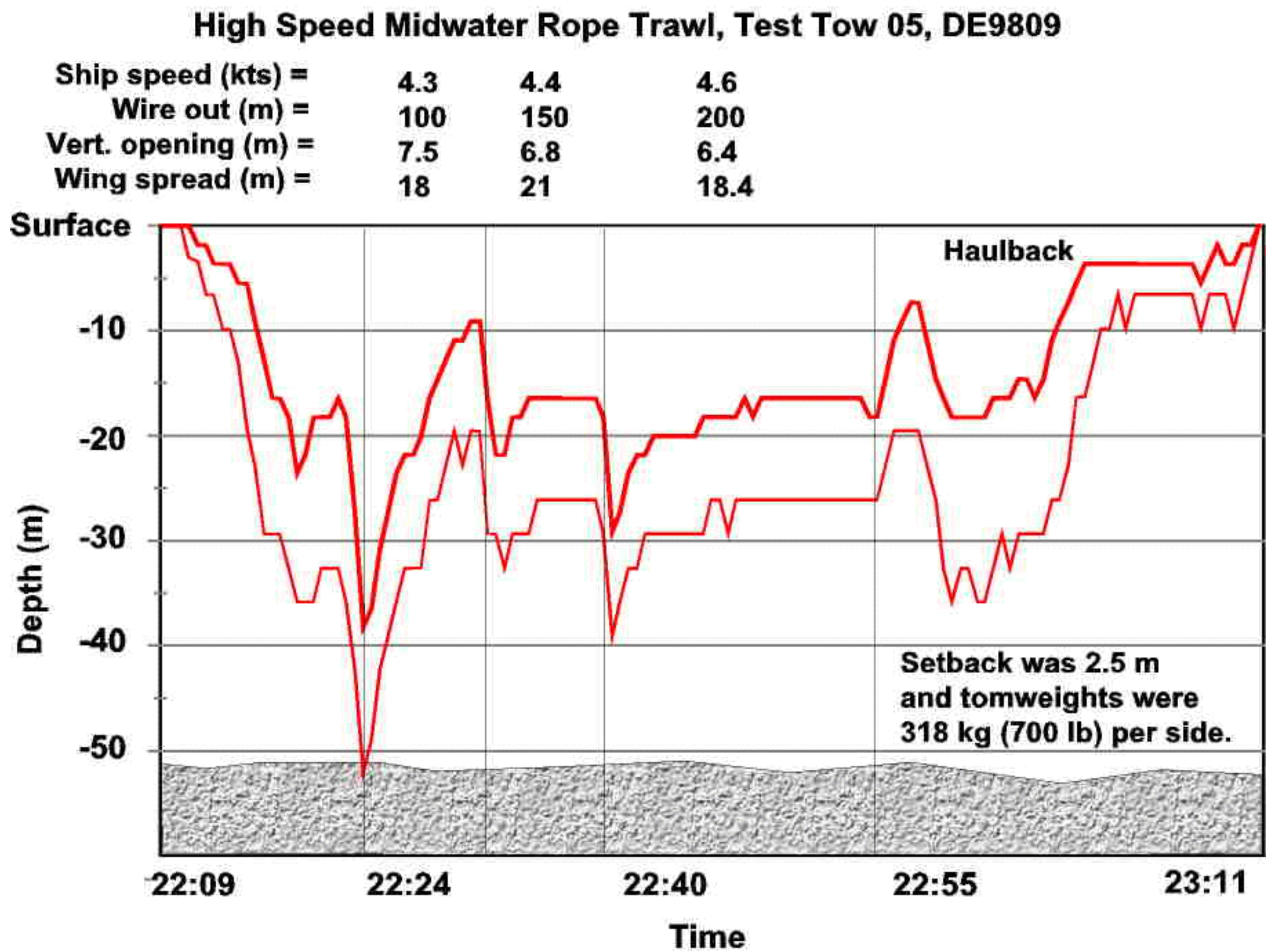


Figure 8. High Speed Rope Midwater Trawl (HSMRT) performance varied with wire-out and tow speed during the Pelagic Trawl/Bioacoustic Shakedown cruise DE 98-09. Minilog time-depth probes on the trawl footrope and headrope demonstrated changes in the vertical mouth opening during trawling, operations, and the potential problem of touching bottom during trawl deployment if ship speed was not maintained during deployment.

Table 1. Eventlog for gear deployments during the Pelagic Trawl/Bioacoustic Shakedown cruise DE 98-09.

| Site | Transect | Deploy | Gear | B_Date | B_Time | B_Lat | B_Lon | B_Vlog | E_Date | E_Time | E_Lat | E_Lon | E_Vlog |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CapeCod_B | --- | 1 | HSMRT | 8/25/98 | 10:55:00 | 42 14.58 | 69 48.00 | --- | 8/25/98 | 12:33:00 | 42 12.27 | 69 38.89 | --- |
| CapeCod_B | --- | 2 | HSMRT | 8/25/98 | 13:26:00 | 42 13.75 | 69 35.06 | --- | 8/25/98 | 14:35:00 | 42 16.53 | 69 29.76 | --- |
| CapeCod_B | --- | 3 | HSMRT | 8/25/98 | 16:46:00 | 42 13.02 | 69 33.80 | --- | 8/25/98 | 17:16:00 | 42 12.77 | 69 35.37 | --- |
| CapeCod_B | --- | 4 | HSMRT | 8/25/98 | 20:10:00 | 42 02.44 | 69 34.32 | --- | 8/25/98 | 21:40:00 | 41 56.95 | 69 30.58 | --- |
| CapeCod_B | --- | 5 | HSMRT | 8/26/98 | 7:30:00 | 43 14.28 | 69 51.19 | --- | 8/26/98 | 9:20:00 | 43 06.91 | 69 48.01 | --- |
| CapeCod_B | --- | 6 | HSMRT | 8/26/98 | 11:45:00 | 43 03.79 | 69 48.74 | --- | 8/26/98 | 12:53:00 | 42 59.35 | 69 49.12 | --- |
| Fippenn_L | --- | 7 | HSMRT | 8/26/98 | 23:15:00 | 43 09.64 | 69 41.22 | 226.8 | 8/26/98 | 23:50:00 | 43 07.90 | 69 39.08 | --- |
| Fippenn_L | --- | 8 | HSMRT | 8/27/98 | 8:15:00 | 43 11.06 | 69 45.88 | --- | 8/27/98 | 9:24:00 | 43 06.67 | 69 45.82 | --- |
| Fippenn_L | --- | 9 | HSMRT | 8/27/98 | 12:00:00 | 42 59.67 | 69 45.37 | --- | 8/27/98 | 12:20:00 | 42 59.82 | 69 45.15 | --- |
| Fippenn_L | --- | 10 | HSMRT | 8/27/98 | 14:20:00 | 42 58.51 | 69 45.46 | --- | 8/27/98 | 15:17:00 | 42 54.92 | 69 47.10 | --- |
| Fippenn_L | --- | 11 | HSMRT | 8/27/98 | 16:14:00 | 42 51.67 | 69 47.56 | --- | 8/27/98 | 17:25:00 | 42 46.69 | 69 46.39 | --- |
| Fippenn_L | --- | 12 | HSMRT | 8/27/98 | 18:55:00 | 42 41.81 | 69 43.24 | --- | 8/27/98 | 19:15:00 | 42 40.58 | 69 42.43 | --- |
| Fippenn_L | --- | 13 | HSMRT | 8/27/98 | 20:07:00 | 42 40.24 | 69 41.44 | --- | 8/27/98 | 20:38:00 | 42 41.91 | 69 42.36 | --- |
| Cashes_L | 24 | 14 | VIDEO | 8/31/98 | 4:55:00 | 42 54.26 | 68 57.36 | 484.6 | 8/31/98 | 5:40:00 | 42 54.63 | 68 57.08 | 484.7 |
| Cashes_L | 26 | 15 | HSMRT | 8/31/98 | 6:30:00 | 42 53.82 | 68 51.47 | 489.0 | 8/31/98 | 6:34:00 | 42 53.71 | 68 51.20 | 489.0 |
| Cashes_L | 26 | 15 | VIDEO | 8/31/98 | 6:30:00 | 42 53.82 | 68 51.47 | 489.0 | 8/31/98 | 6:34:00 | 42 53.71 | 68 51.20 | 489.0 |
| Cashes_L | 26 | 16 | VIDEO | 8/31/98 | 8:30:00 | 42 52.21 | 68 46.94 | --- | 8/31/98 | 9:30:00 | 42 51.75 | 68 46.73 | --- |
| Cashes_L | 27 | 17 | HSMRT | 8/31/98 | 11:43:00 | 42 45.83 | 68 46.56 | 499.6 | 8/31/98 | 12:24:00 | 42 43.31 | 68 46.69 | 502.1 |
| Cashes_L | 27 | 17 | VIDEO | 8/31/98 | 11:43:00 | 42 45.83 | 68 46.56 | 499.6 | 8/31/98 | 12:24:00 | 42 43.31 | 68 46.69 | 502.1 |
| Cashes_L | 28 | 18 | HSMRT | 8/31/98 | 16:11:00 | 42 47.85 | 68 46.80 | 511.0 | 8/31/98 | 16:44:00 | 42 50.29 | 68 46.66 | 514.0 |
| Cashes_L | 28 | 18 | VIDEO | 8/31/98 | 16:11:00 | 42 47.85 | 68 46.80 | 511.0 | 8/31/98 | 16:44:00 | 42 50.29 | 68 46.66 | 514.0 |
| Cashes_L | 32 | 19 | HSMRT | 8/31/98 | 19:54:00 | 42 54.91 | 68 49.39 | 536.0 | 8/31/98 | 20:28:00 | 42 53.60 | 68 46.80 | 538.7 |
| Cashes_L | 39 | 20 | VIDEO | 9/1/98 | 1:51:00 | 42 52.38 | 68 55.55 | 582.7 | 9/1/98 | 2:55:00 | 42 52.25 | 68 55.88 | 583.8 |
| Cashes_L | 39 | 21 | HSMRT | 9/1/98 | 7:10:00 | 42 53.10 | 68 50.77 | 594.5 | 9/1/98 | 7:41:00 | 42 52.15 | 68 48.04 | --- |
| Jeffreys_L | 66 | 22 | VIDEO | 9/2/98 | 12:32:00 | 42 49.58 | 70 30.17 | --- | 9/2/98 | 13:06:00 | 42 49.64 | 70 30.32 | --- |
| Jeffreys_L | 66 | 23 | HSMRT | 9/2/98 | 13:15:00 | 42 49.67 | 70 30.34 | --- | 9/2/98 | 13:59:00 | 42 49.65 | 70 27.29 | 834.8 |
| Jeffreys_L | 66 | 23 | VIDEO | 9/2/98 | 13:15:00 | 42 49.67 | 70 30.34 | --- | 9/2/98 | 13:59:00 | 42 49.65 | 70 27.29 | 834.8 |
| Jeffreys_L | 66 | 24 | HSMRT | 9/2/98 | 14:04:00 | 42 49.60 | 70 26.86 | --- | 9/2/98 | 14:29:00 | 42 49.07 | 70 24.70 | --- |
| Jeffreys_L | 66 | 24 | VIDEO | 9/2/98 | 14:04:00 | 42 49.60 | 70 26.86 | --- | 9/2/98 | 14:29:00 | 42 49.07 | 70 24.70 | --- |
| Jeffreys_L | 66 | 25 | VIDEO | 9/2/98 | 15:30:00 | 42 49.04 | 70 15.79 | --- | 9/2/98 | 16:10:00 | 42 49.26 | 70 15.92 | --- |
| Jeffreys_L | 67 | 26 | HSMRT | 9/2/98 | 21:28:00 | 42 50.16 | 70 31.32 | 863.8 | 9/2/98 | 22:01:00 | 42 49.60 | 70 28.21 | --- |
| Jeffreys_L | 68 | 27 | VIDEO | 9/3/98 | 0:19:00 | 42 49.18 | 70 15.51 | 879.8 | 9/3/98 | 0:56:00 | 42 49.34 | 70 15.28 | --- |
| Jeffreys_L | 68 | 27 | VIDEO | 9/3/98 | 1:11:00 | 42 49.03 | 70 15.53 | 880.8 | 9/3/98 | 1:29:00 | 42 49.15 | 70 15.54 | --- |
| Gulf_Maine | 76 | 28 | HSMRT | 9/10/98 | 2:15:00 | 42 07.42 | 70 04.25 | --- | 9/10/98 | 3:02:00 | 42 07.25 | 70 07.24 | --- |
| Gulf_Maine | 76 | 28 | CTD | 9/10/98 | 3:45:00 | 42 06.83 | 70 08.06 | --- | 9/10/98 | 4:10:00 | 42 06.51 | 70 05.82 | 23.3 |
| Gulf_Maine | 76 | 29 | HSMRT | 9/10/98 | 9:22:00 | 42 06.97 | 69 01.16 | 73.9 | 9/10/98 | 9:59:00 | 42 08.68 | 69 03.73 | --- |
| Gulf_Maine | 76 | 29 | CTD | 9/10/98 | 10:43:00 | 42 08.05 | 69 02.45 | --- | 9/10/98 | 10:45:00 | 42 08.04 | 69 02.42 | --- |
| Gulf_Maine | 76 | 29 | VIDEO | 9/10/98 | 10:43:00 | 42 08.05 | 69 02.45 | --- | 9/10/98 | 10:45:00 | 42 08.04 | 69 02.42 | --- |
| Gulf_Maine | 82 | 30 | HSMRT | 9/11/98 | 15:30:00 | 42 35.74 | 68 58.89 | 358.6 | 9/11/98 | 16:05:00 | 42 35.25 | 68 55.34 | --- |

Table 1. Cont.

| Site | Transect | Deploy | Gear | B_Date | B_Time | B_Lat | B_Lon | B_Vlog | E_Date | E_Time | E_Lat | E_Lon | E_Vlog |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gulf_Maine | 90 | 31 | HSMRT | 9/13/98 | 14:49:00 | 43 16.35 | 68 44.74 | 792.6 | 9/13/98 | 15:27:00 | 43 16.80 | 68 47.99 | 794.9 |
| Gulf_Maine | 98 | 32 | VIDEO | 9/14/98 | 21:37:00 | 43 52.70 | 68 42.08 | 1114.1 | 9/14/98 | 22:00:00 | 43 52.55 | 68 42.09 | 1114.1 |
| Gulf_Maine | 98 | 33 | VIDEO | 9/14/98 | 22:11:00 | 43 52.94 | 68 41.86 | 1114.1 | 9/14/98 | 22:33:00 | 43 52.76 | 68 41.74 | 1114.1 |
| Georges_B | 115 | 34 | HSMRT | 9/16/98 | 20:09:00 | 42 10.60 | 67 17.36 | --- | 9/16/98 | 20:58:00 | 42 11.94 | 67 13.33 | --- |
| Georges_B | 115 | 35 | HSMRT | 9/17/98 | 3:37:00 | 41 49.43 | 68 13.29 | 1631.7 | 9/17/98 | 3:48:00 | 41 49.24 | 68 12.51 | --- |
| Georges_B | 115 | 36 | HSMRT | 9/17/98 | 4:43:00 | 41 50.49 | 68 12.08 | --- | 9/17/98 | 5:03:00 | 41 49.80 | 68 13.15 | 1636.9 |

Table 2. Transect table for the Pelagic Trawl/Bioacoustic Shakedown cruise DE 98-09.

| Site | B_Date | B_Time | B_Lat | B_Lon | B_Vlog | Transect | TransType | E_Date | E_Time | E_Lat | E_Lon | E_Vlog |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fippenn_L | 8/30/98 | 16:00:00 | 42 49.49 | 69 24.74 | 354.9 | 1 | parallel | 8/30/98 | 16:56:00 | 42 49.47 | 69 11.13 | 364.7 |
| Fippenn_L | 8/30/98 | 16:56:00 | 42 49.47 | 69 11.13 | 364.7 | 2 | crossover | 8/30/98 | 17:11:00 | 42 46.97 | 69 11.43 | 367.3 |
| Fippenn_L | 8/30/98 | 17:11:00 | 42 46.97 | 69 11.43 | 367.3 | 3 | parallel | 8/30/98 | 18:04:00 | 42 46.88 | 69 24.43 | 377.1 |
| Fippenn_L | 8/30/98 | 18:04:00 | 42 46.88 | 69 24.43 | 377.1 | 4 | crossover | 8/30/98 | 18:17:00 | 42 44.61 | 69 23.71 | 379.5 |
| Fippenn_L | 8/30/98 | 18:17:00 | 42 44.61 | 69 23.71 | 379.5 | 5 | parallel | 8/30/98 | 19:15:00 | 42 44.73 | 69 10.04 | 390.0 |
| Fippenn_L | 8/30/98 | 19:15:00 | 42 44.73 | 69 10.04 | 390.0 | 6 | parallel | 8/30/98 | 20:13:00 | 42 44.74 | 69 24.16 | 400.8 |
| Fippenn_L | 8/30/98 | 20:14:00 | 42 44.91 | 69 24.21 | 400.8 | 7 | crossover | 8/30/98 | 20:28:00 | 42 47.20 | 69 24.18 | 403.3 |
| Fippenn_L | 8/30/98 | 20:28:00 | 42 47.20 | 69 24.18 | 403.3 | 8 | parallel | 8/30/98 | 21:22:00 | 42 47.24 | 69 11.48 | 413.0 |
| Fippenn_L | 8/30/98 | 21:23:00 | 42 47.42 | 69 11.48 | 413.0 | 9 | crossover | 8/30/98 | 21:39:00 | 42 49.71 | 69 12.17 | 415.3 |
| Fippenn_L | 8/30/98 | 21:39:00 | 42 49.71 | 69 12.17 | 415.3 | 10 | parallel | 8/30/98 | 22:35:00 | 42 49.37 | 69 24.99 | 425.2 |
| Fippenn_L | 8/30/98 | 22:35:00 | 42 49.37 | 69 24.99 | 425.2 | 11 | steaming | 8/30/98 | 23:37:00 | 42 47.15 | 69 10.49 | 435.8 |
| enroute_CL | 8/30/98 | 23:37:00 | 42 47.15 | 69 10.49 | 435.8 | 12 | steaming | 8/31/98 | 0:30:00 | 42 47.96 | 68 57.75 | 445.8 |
| Cashes_L | 8/31/98 | 0:30:00 | 42 47.96 | 68 57.75 | 445.8 | 13 | parallel | 8/31/98 | 0:40:00 | 42 48.15 | 68 55.40 | 447.3 |
| Cashes_L | 8/31/98 | 0:40:00 | 42 48.15 | 68 55.40 | 447.3 | 14 | zigzag | 8/31/98 | 0:46:00 | 42 48.92 | 68 54.35 | 448.3 |
| Cashes_L | 8/31/98 | 0:46:00 | 42 48.92 | 68 54.35 | 448.3 | 15 | zigzag | 8/31/98 | 0:55:00 | 42 47.90 | 68 52.81 | 450.0 |
| Cashes_L | 8/31/98 | 0:55:00 | 42 47.90 | 68 52.81 | 450.0 | 16 | parallel | 8/31/98 | 1:09:00 | 42 48.11 | 68 49.42 | 452.8 |
| Cashes_L | 8/31/98 | 1:09:00 | 42 48.11 | 68 49.42 | 452.8 | 17 | crossover | 8/31/98 | 1:28:00 | 42 51.30 | 68 50.94 | 456.4 |
| Cashes_L | 8/31/98 | 1:28:00 | 42 51.30 | 68 50.94 | 456.4 | 18 | parallel | 8/31/98 | 2:10:00 | 42 51.33 | 69 01.16 | 463.7 |
| Cashes_L | 8/31/98 | 2:10:00 | 42 51.33 | 69 01.16 | 463.7 | 19 | parallel | 8/31/98 | 2:27:00 | 42 51.16 | 68 57.25 | 466.5 |
| Cashes_L | 8/31/98 | 2:47:00 | 42 51.24 | 68 57.23 | 467.2 | 20 | parallel | 8/31/98 | 3:00:00 | 42 51.17 | 68 59.51 | 469.0 |
| Cashes_L | 8/31/98 | 3:00:00 | 42 51.17 | 68 59.51 | 469.0 | 21 | parallel | 8/31/98 | 3:23:00 | 42 51.44 | 68 54.06 | 473.0 |
| Cashes_L | 8/31/98 | 3:23:00 | 42 51.44 | 68 54.06 | 473.0 | 22 | crossover | 8/31/98 | 3:39:00 | 42 54.33 | 68 52.83 | 476.2 |
| Cashes_L | 8/31/98 | 3:39:00 | 42 54.33 | 68 52.83 | 476.2 | 23 | parallel | 8/31/98 | 4:12:00 | 42 54.30 | 68 59.65 | 481.0 |
| Cashes_L | 8/31/98 | 4:21:00 | 42 54.28 | 68 59.23 | 481.5 | 24 | steaming | 8/31/98 | 4:39:00 | 42 53.35 | 68 57.20 | 483.0 |
| Cashes_L | 8/31/98 | 5:43:00 | 42 54.62 | 68 57.07 | 485.0 | 25 | parallel | 8/31/98 | 6:02:00 | 42 54.60 | 68 54.34 | 486.9 |
| Cashes_L | 8/31/98 | 6:02:00 | 42 54.60 | 68 54.34 | 486.9 | 26 | steaming | 8/31/98 | 6:30:00 | 42 53.82 | 68 51.47 | 489.0 |
| Cashes_L | 8/31/98 | 10:35:00 | 42 51.09 | 68 46.53 | --- | 27 | steaming | 8/31/98 | 11:40:00 | 42 46.01 | 68 46.54 | 499.6 |
| Cashes_L | 8/31/98 | 15:32:00 | 42 44.56 | 68 46.83 | --- | 28 | steaming | 8/31/98 | 16:05:00 | 42 47.44 | 68 46.80 | --- |
| Cashes_L | 8/31/98 | 17:20:00 | 42 52.26 | 68 46.76 | 515.0 | 29 | steaming | 8/31/98 | 18:23:00 | 43 01.21 | 68 56.44 | 527.1 |
| Cashes_L | 8/31/98 | 18:23:00 | 43 01.21 | 68 56.44 | 527.1 | 30 | steaming | 8/31/98 | 18:44:00 | 42 57.62 | 68 55.52 | 530.7 |
| Cashes_L | 8/31/98 | 18:44:00 | 42 57.62 | 68 55.52 | 530.7 | 31 | steaming | 8/31/98 | 19:00:00 | 42 56.84 | 68 51.86 | 533.5 |
| Cashes_L | 8/31/98 | 19:26:00 | 42 56.44 | 68 51.17 | --- | 32 | steaming | 8/31/98 | 19:49:00 | 42 55.26 | 68 49.78 | 535.9 |
| Cashes_L | 8/31/98 | 21:02:00 | 42 53.99 | 68 44.64 | --- | 33 | steaming | 8/31/98 | 21:23:00 | 42 54.80 | 68 47.85 | --- |
| Cashes_L | 8/31/98 | 21:23:00 | 42 54.80 | 68 47.85 | --- | 34 | steaming | 8/31/98 | 21:30:00 | 42 54.88 | 68 49.48 | --- |
| Cashes_L | 8/31/98 | 21:30:00 | 42 54.88 | 68 49.48 | --- | 35 | steaming | 8/31/98 | 22:03:00 | 42 56.97 | 68 56.59 | --- |
| Cashes_L | 8/31/98 | 22:03:00 | 42 56.97 | 68 56.59 | --- | 36 | steaming | 8/31/98 | 22:34:00 | 43 02.13 | 68 58.86 | 555.5 |
| Cashes_L | 8/31/98 | 22:34:00 | 43 02.13 | 68 58.86 | 555.5 | 37 | steaming | 8/31/98 | 23:55:00 | 42 47.39 | 68 54.96 | 570.0 |
| Cashes_L | 8/31/98 | 23:58:00 | 42 47.47 | 68 54.79 | 571.0 | 38 | steaming | 9/1/98 | 0:19:00 | 42 51.04 | 68 55.52 | 574.4 |
| Cashes_L | 9/1/98 | 0:19:00 | 42 51.04 | 68 55.52 | 574.4 | 39 | steaming | 9/1/98 | 1:12:00 | 42 51.91 | 68 55.79 | 580.8 |
| Cashes_L | 9/1/98 | 8:22:00 | 42 50.13 | 68 47.89 | --- | 40 | steaming | 9/1/98 | 9:16:00 | 42 49.89 | 69 00.55 | --- |
| enroute_JL | 9/1/98 | 9:16:00 | 42 49.89 | 69 00.55 | --- | 41 | steaming | 9/1/98 | 9:57:00 | 42 49.74 | 69 11.34 | --- |

| Site | B_Date | B_Time | B_Lat | B_Lon | B_Vlog | Transect | TransType | E_Date | E_Time | E_Lat | E_Lon | E_Vlog |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| enroute_JL | 9/1/98 | 9:57:00 | 42 49.74 | 69 11.34 | --- | 42 | steaming | 9/1/98 | 10:51:00 | 42 49.58 | 69 25.24 | --- |
| enroute_JL | 9/1/98 | 10:51:00 | 42 49.58 | 69 25.24 | --- | 43 | steaming | 9/1/98 | 12:40:00 | 42 49.29 | 69 52.26 | --- |
| enroute_JL | 9/1/98 | 13:12:00 | 42 49.23 | 69 54.07 | --- | 44 | steaming | 9/1/98 | 14:10:00 | 42 47.74 | 70 08.30 | --- |
| Jeffreys_L | 9/1/98 | 14:10:00 | 42 47.74 | 70 08.30 | --- | 45 | parallel | 9/1/98 | 15:23:00 | 42 47.92 | 70 26.70 | --- |
| Jeffreys_L | 9/1/98 | 15:23:00 | 42 47.92 | 70 26.70 | --- | 46 | crossover | 9/1/98 | 16:16:00 | 42 57.50 | 70 26.06 | 656.8 |
| Jeffreys_L | 9/1/98 | 16:16:00 | 42 57.50 | 70 26.06 | 656.8 | 47 | parallel | 9/1/98 | 18:13:00 | 42 57.40 | 69 57.23 | 678.0 |
| Jeffreys_L | 9/1/98 | 18:13:00 | 42 57.40 | 69 57.23 | 678.0 | 48 | crossover | 9/1/98 | 18:50:00 | 43 04.24 | 69 57.08 | 684.9 |
| Jeffreys_L | 9/1/98 | 18:50:00 | 43 04.24 | 69 57.08 | 684.9 | 49 | parallel | 9/1/98 | 20:01:00 | 43 04.50 | 70 14.31 | 697.5 |
| Jeffreys_L | 9/1/98 | 20:01:00 | 43 04.50 | 70 14.31 | 697.5 | 50 | crossover | 9/1/98 | 20:41:00 | 43 11.58 | 70 13.82 | 704.9 |
| Jeffreys_L | 9/1/98 | 20:41:00 | 43 11.58 | 70 13.82 | 704.9 | 51 | parallel | 9/1/98 | 21:51:00 | 43 11.57 | 69 56.41 | 717.4 |
| Jeffreys_L | 9/1/98 | 21:51:00 | 43 11.57 | 69 56.41 | 717.4 | 52 | crossover | 9/1/98 | 22:16:00 | 43 15.77 | 69 58.41 | 722.9 |
| Jeffreys_L | 9/1/98 | 22:16:00 | 43 15.77 | 69 58.41 | 722.9 | 53 | parallel | 9/1/98 | 22:53:00 | 43 15.74 | 70 07.55 | 728.7 |
| Jeffreys_L | 9/1/98 | 22:53:00 | 43 15.74 | 70 07.55 | 728.7 | 54 | parallel | 9/1/98 | 23:27:00 | 43 11.38 | 70 13.21 | 734.8 |
| Jeffreys_L | 9/2/98 | 0:01:00 | 43 11.44 | 70 12.91 | --- | 55 | parallel | 9/2/98 | 0:11:00 | 43 12.77 | 70 11.20 | --- |
| Jeffreys_L | 9/2/98 | 0:11:00 | 43 12.77 | 70 11.20 | --- | 56 | parallel | 9/2/98 | 0:55:00 | 43 10.67 | 70 13.64 | 741.0 |
| Jeffreys_L | 9/2/98 | 1:08:00 | 43 11.06 | 70 14.06 | 741.7 | 57 | parallel | 9/2/98 | 2:20:00 | 43 14.30 | 70 09.55 | --- |
| Jeffreys_L | 9/2/98 | 2:27:00 | 43 14.40 | 70 08.87 | --- | 58 | parallel | 9/2/98 | 2:55:00 | 43 14.11 | 70 02.18 | 751.9 |
| Jeffreys_L | 9/2/98 | 2:58:00 | 43 13.68 | 70 01.94 | 752.1 | 59 | steaming | 9/2/98 | 4:29:00 | 42 57.48 | 70 05.48 | 768.6 |
| Jeffreys_L | 9/2/98 | 4:29:00 | 42 57.48 | 70 05.48 | 768.6 | 60 | steaming | 9/2/98 | 5:02:00 | 42 53.20 | 70 11.28 | 774.7 |
| Jeffreys_L | 9/2/98 | 5:02:00 | 42 53.20 | 70 11.28 | 774.7 | 61 | steaming | 9/2/98 | 6:30:00 | 42 44.80 | 70 29.96 | 790.8 |
| Jeffreys_L | 9/2/98 | 6:32:00 | 42 44.70 | 70 30.41 | 791.0 | 62 | steaming | 9/2/98 | 6:53:00 | 42 42.65 | 70 34.83 | 795.0 |
| Jeffreys_L | 9/2/98 | 6:53:00 | 42 42.65 | 70 34.83 | 795.0 | 63 | steaming | 9/2/98 | 7:07:00 | 42 45.02 | 70 35.68 | 797.5 |
| Jeffreys_L | 9/2/98 | 7:07:00 | 42 45.02 | 70 35.68 | 797.5 | 64 | steaming | 9/2/98 | 8:50:00 | 42 54.11 | 70 14.41 | --- |
| Jeffreys_L | 9/2/98 | 8:50:00 | 42 54.11 | 70 14.41 | --- | 65 | steaming | 9/2/98 | 9:31:00 | 42 49.08 | 70 15.69 | 820.9 |
| Jeffreys_L | 9/2/98 | 9:31:00 | 42 49.08 | 70 15.69 | 820.9 | 66 | steaming | 9/2/98 | 11:32:00 | 42 49.52 | 70 29.64 | 831.1 |
| Jeffreys_L | 9/2/98 | 17:31:00 | 42 48.94 | 70 15.49 | 846.4 | 67 | steaming | 9/2/98 | 19:24:00 | 42 49.48 | 70 29.58 | 856.8 |
| Jeffreys_L | 9/2/98 | 23:33:00 | 42 50.63 | 70 25.97 | --- | 68 | steaming | 9/3/98 | 0:17:00 | 42 49.21 | 70 15.64 | --- |
| Jeff_Cove | 9/3/98 | 1:37:00 | 42 49.16 | 70 15.46 | 881.1 | 69 | parallel | 9/3/98 | 2:40:00 | 42 49.34 | 70 25.21 | 888.5 |
| Jeff_Cove | 9/3/98 | 2:40:00 | 42 49.34 | 70 25.21 | 888.5 | 70 | crossover | 9/3/98 | 2:50:00 | 42 50.60 | 70 24.98 | 889.8 |
| Jeff_Cove | 9/3/98 | 2:50:00 | 42 50.60 | 70 24.98 | 889.8 | 71 | parallel | 9/3/98 | 3:42:00 | 42 50.24 | 70 15.67 | 896.7 |
| Jeff_Cove | 9/3/98 | 3:42:00 | 42 50.24 | 70 15.67 | 896.7 | 72 | crossover | 9/3/98 | 3:51:00 | 42 51.27 | 70 15.87 | 897.8 |
| Jeff_Cove | 9/3/98 | 3:51:00 | 42 51.27 | 70 15.87 | 897.8 | 73 | parallel | 9/3/98 | 4:46:00 | 42 51.23 | 70 25.07 | --- |
| Jeff_Cove | 9/3/98 | 4:46:00 | 42 51.23 | 70 25.07 | --- | 74 | crossover | 9/3/98 | 4:58:00 | 42 52.66 | 70 25.05 | --- |
| Jeff_Cove | 9/3/98 | 4:58:00 | 42 52.66 | 70 25.05 | --- | 75 | parallel | 9/3/98 | 5:54:00 | 42 52.53 | 70 15.39 | --- |
| Gulf_Maine | 9/10/98 | 0:20:00 | 42 06.09 | 70 21.92 | 1.3 | 76 | parallel | 9/10/98 | 1:17:00 | 42 06.98 | 70 08.92 | 11.1 |
| Gulf_Maine | 9/10/98 | 4:10:00 | 42 06.51 | 70 05.82 | 23.3 | 76 | parallel | 9/10/98 | 8:45:00 | 42 06.02 | 69 00.76 | 71.8 |
| Gulf_Maine | 9/10/98 | 11:23:00 | 42 06.28 | 68 58.67 | 82.5 | 76 | parallel | 9/10/98 | 13:27:00 | 42 05.88 | 68 28.85 | 104.8 |
| Gulf_Maine | 9/10/98 | 13:27:00 | 42 05.88 | 68 28.85 | 104.8 | 77 | crossover | 9/10/98 | 14:37:00 | 42 15.82 | 68 29.90 | 114.7 |
| Gulf_Maine | 9/10/98 | 14:37:00 | 42 15.82 | 68 29.90 | 114.7 | 78 | parallel | 9/11/98 | 1:44:00 | 42 16.14 | 70 39.71 | 211.4 |
| Gulf_Maine | 9/11/98 | 1:44:00 | 42 16.14 | 70 39.71 | 211.4 | 79 | crossover | 9/11/98 | 2:46:00 | 42 25.75 | 70 46.62 | 222.3 |
| Gulf_Maine | 9/11/98 | 2:46:00 | 42 25.75 | 70 46.62 | 222.3 | 80 | parallel | 9/11/98 | 11:43:00 | 42 26.23 | 68 30.34 | 323.2 |
| Gulf_Maine | 9/11/98 | 11:43:00 | 42 26.23 | 68 30.34 | 323.2 | 81 | crossover | 9/11/98 | 12:36:00 | 42 35.81 | 68 30.08 | 332.9 |
| Gulf_Maine | 9/11/98 | 12:36:00 | 42 35.81 | 68 30.08 | 332.9 | 82 | parallel | 9/11/98 | 15:00:00 | 42 36.13 | 68 57.97 | --- |

| Site | B_Date | B_Time | B_Lat | B_Lon | B_Vlog | Transect | TransType | E_Date | E_Time | E_Lat | E_Lon | E_Vlog |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gulf_Maine | 9/12/98 | 1:27:00 | 42 36.07 | 68 59.22 | 389.4 | 82 | parallel | 9/12/98 | 7:31:00 | 42 35.85 | 70 28.53 | 455.5 |
| Gulf_Maine | 9/12/98 | 7:31:00 | 42 35.85 | 70 28.53 | 455.5 | 83 | crossover | 9/12/98 | 8:28:00 | 42 45.96 | 70 28.09 | 465.9 |
| Gulf_Maine | 9/12/98 | 8:28:00 | 42 45.96 | 70 28.09 | 465.9 | 84 | parallel | 9/12/98 | 16:21:00 | 42 46.28 | 68 30.22 | 553.3 |
| Gulf_Maine | 9/12/98 | 16:21:00 | 42 46.28 | 68 30.22 | 553.3 | 85 | crossover | 9/12/98 | 17:16:00 | 42 55.98 | 68 29.90 | 563.0 |
| Gulf_Maine | 9/12/98 | 17:16:00 | 42 55.98 | 68 29.90 | 563.0 | 86 | parallel | 9/13/98 | 2:15:00 | 42 56.09 | 70 42.05 | 660.3 |
| Gulf_Maine | 9/13/98 | 2:15:00 | 42 56.09 | 70 42.05 | 660.3 | 87 | crossover | 9/13/98 | 3:18:00 | 43 05.13 | 70 33.03 | 671.2 |
| Gulf_Maine | 9/13/98 | 3:18:00 | 43 05.13 | 70 33.03 | 671.2 | 88 | parallel | 9/13/98 | 11:20:00 | 43 06.12 | 68 29.98 | 761.6 |
| Gulf_Maine | 9/13/98 | 11:20:00 | 43 06.12 | 68 29.98 | 761.6 | 89 | crossover | 9/13/98 | 12:15:00 | 43 15.93 | 68 30.08 | --- |
| Gulf_Maine | 9/13/98 | 12:15:00 | 43 15.93 | 68 30.08 | --- | 90 | parallel | 9/13/98 | 13:03:00 | 43 15.87 | 68 42.00 | 779.9 |
| Gulf_Maine | 9/13/98 | 16:32:00 | 43 15.47 | 68 52.41 | 798.7 | 90 | parallel | 9/13/98 | 22:41:00 | 43 16.03 | 70 25.07 | 866.5 |
| Gulf_Maine | 9/13/98 | 22:41:00 | 43 16.03 | 70 25.07 | 886.5 | 91 | crossover | 9/13/98 | 23:44:00 | 43 25.87 | 70 16.81 | 878.1 |
| Gulf_Maine | 9/13/98 | 23:44:00 | 43 25.87 | 70 16.81 | 878.1 | 92 | parallel | 9/14/98 | 6:41:00 | 43 26.40 | 68 29.95 | 955.9 |
| Gulf_Maine | 9/14/98 | 6:41:00 | 43 26.40 | 68 29.95 | 955.9 | 93 | crossover | 9/14/98 | 7:37:00 | 43 36.07 | 68 30.23 | 965.7 |
| Gulf_Maine | 9/14/98 | 7:37:00 | 43 36.07 | 68 30.23 | 965.7 | 94 | parallel | 9/14/98 | 13:35:00 | 43 36.07 | 70 01.33 | 1031.9 |
| Gulf_Maine | 9/14/98 | 13:35:00 | 43 36.07 | 70 01.33 | 1031.9 | 95 | crossover | 9/14/98 | 16:47:00 | 43 48.94 | 69 16.40 | 1067.3 |
| Gulf_Maine | 9/14/98 | 16:47:00 | 43 48.94 | 69 16.40 | 1067.3 | 96 | crossover | 9/14/98 | 17:07:00 | 43 46.02 | 69 13.43 | 1069.9 |
| Gulf_Maine | 9/14/98 | 17:07:00 | 43 46.02 | 69 13.43 | 1069.9 | 97 | parallel | 9/14/98 | 20:01:00 | 43 46.08 | 68 29.85 | 1102.5 |
| Gulf_Maine | 9/14/98 | 20:01:00 | 43 46.08 | 68 29.85 | 1102.5 | 98 | crossover | 9/14/98 | 20:02:00 | 43 46.21 | 68 29.94 | 1102.6 |
| Gulf_Maine | 9/14/98 | 22:44:00 | 43 53.10 | 68 41.93 | 1114.1 | 99 | parallel | 9/15/98 | 3:33:00 | 43 53.12 | 67 29.91 | 1166.0 |
| Gulf_Maine | 9/15/98 | 3:33:00 | 43 53.12 | 67 29.91 | 1166.0 | 100 | crossover | 9/15/98 | 4:25:00 | 44 02.97 | 67 29.97 | 1175.9 |
| Gulf_Maine | 9/15/98 | 4:25:00 | 44 02.97 | 67 29.97 | 1175.9 | 101 | parallel | 9/15/98 | 8:31:00 | 44 03.02 | 68 32.22 | 1221.0 |
| Gulf_Maine | 9/15/98 | 8:31:00 | 44 03.02 | 68 32.22 | 1221.0 | 102 | crossover | 9/15/98 | 9:51:00 | 44 05.74 | 68 14.28 | 1234.9 |
| Gulf_Maine | 9/15/98 | 9:51:00 | 44 05.74 | 68 14.28 | 1234.9 | 103 | crossover | 9/15/98 | 10:38:00 | 44 12.96 | 68 09.90 | 1242.8 |
| Gulf_Maine | 9/15/98 | 10:38:00 | 44 12.96 | 68 09.90 | 1242.8 | 104 | parallel | 9/15/98 | 13:21:00 | 44 13.13 | 67 30.43 | 1271.3 |
| Gulf_Maine | 9/15/98 | 13:21:00 | 44 13.13 | 67 30.43 | 1271.3 | 105 | steaming | 9/15/98 | 16:40:00 | 43 59.83 | 68 15.06 | 1306.6 |
| enroute_GB | 9/15/98 | 16:40:00 | 43 59.83 | 68 15.06 | 1306.6 | 106 | steaming | 9/16/98 | 6:51:00 | 41 50.00 | 68 14.95 | 1436.5 |
| Georges_B | 9/16/98 | 6:51:00 | 41 50.00 | 68 14.95 | 1436.5 | 107 | zigzag | 9/16/98 | 7:44:00 | 41 47.15 | 68 04.61 | 1444.9 |
| Georges_B | 9/16/98 | 7:44:00 | 41 47.15 | 68 04.61 | 1444.9 | 108 | zigzag | 9/16/98 | 9:00:00 | 42 00.17 | 67 59.47 | 1458.4 |
| Georges_B | 9/16/98 | 9:00:00 | 42 00.17 | 67 59.47 | 1458.4 | 109 | zigzag | 9/16/98 | 10:18:00 | 41 49.46 | 67 51.67 | 1470.7 |
| Georges_B | 9/16/98 | 10:18:00 | 41 49.46 | 67 51.67 | 1470.7 | 110 | zigzag | 9/16/98 | 11:52:00 | 42 04.62 | 67 46.09 | 1486.9 |
| Georges_B | 9/16/98 | 11:52:00 | 42 04.62 | 67 46.09 | 1486.9 | 111 | zigzag | 9/16/98 | 13:17:00 | 41 50.87 | 67 34.67 | 1503.1 |
| Georges_B | 9/16/98 | 13:17:00 | 41 50.87 | 67 34.67 | 1503.1 | 112 | zigzag | 9/16/98 | 15:10:00 | 42 08.88 | 67 29.43 | 1521.7 |
| Georges_B | 9/16/98 | 15:10:00 | 42 08.88 | 67 29.43 | 1521.7 | 113 | zigzag | 9/16/98 | 17:59:00 | 42 03.18 | 67 13.00 | 1551.2 |
| Georges_B | 9/16/98 | 17:59:00 | 42 03.18 | 67 13.00 | 1551.2 | 114 | zigzag | 9/16/98 | 18:45:00 | 42 12.01 | 67 11.45 | 1560.1 |
| Georges_B | 9/16/98 | 18:45:00 | 42 12.01 | 67 11.45 | 1560.1 | 115 | steaming | 9/16/98 | 19:08:00 | 42 10.47 | 67 17.53 | 1564.3 |
| Georges_B | 9/16/98 | 21:28:00 | 42 11.96 | 67 11.78 | 1574.9 | 115 | steaming | 9/17/98 | 2:44:00 | 41 49.86 | 68 14.87 | 1626.6 |
| Georges_B | 9/17/98 | 5:50:00 | 41 49.26 | 68 16.75 | --- | 116 | zigzag | 9/17/98 | 6:36:00 | 41 41.89 | 68 14.67 | 1647.3 |
| Georges_B | 9/17/98 | 6:36:00 | 41 41.89 | 68 14.67 | 1647.3 | 117 | zigzag | 9/17/98 | 7:28:00 | 41 49.33 | 68 23.58 | 1657.2 |
| Georges_B | 9/17/98 | 7:28:00 | 41 49.33 | 68 23.58 | 1657.2 | 118 | zigzag | 9/17/98 | 8:32:00 | 41 39.73 | 68 19.69 | 1667.5 |
| enroute_WH | 9/17/98 | 8:32:00 | 41 39.73 | 68 19.69 | 1667.5 | 119 | steaming | 9/17/98 | 14:16:00 | 41 26.32 | 69 43.24 | 1732.8 |